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New species of *Graphis* and *Hemithecium* (lichenized *Ascomycota*) from Eastern Himalaya, India

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Abstract — Two new species, *Graphis neoraensis* and *Hemithecium himalayanum* (*Graphidaceae*) are described from the well protected Neora Valley National Park in the Eastern Himalaya, India.

Key words — *Ostropales*, taxonomy

Introduction

Neora Valley National Park is one of the undisturbed natural ecosystems in the Eastern Himalaya. It extends over an 88 sq km area bordering Sikkim and Bhutan in the Darjeeling district of West Bengal State. During lichen survey tours to the park in March 2007 and May 2008 several lichen samples were collected and are now preserved in the BSA herbarium of the Botanical Survey of India. While studying specimens in the lichen family *Graphidaceae*, two species in the genera *Graphis* and *Hemithecium* were found to be new to science, which are described in the present paper. Makhija & Adawadkar (2005a,b), Adawadkar & Makhija (2005, 2006, 2007), and Chitale et al. (2009) made some significant contributions to these genera from India.

Materials and methods

Specimens collected from Neora Valley National Park and deposited in BSA were investigated. External morphological features were observed with an Olympus SZ61 Stereo microscope. Thin hand-cut sections of thalli were mounted in water, 10% KOH solution, Lugol's iodine solution and lactophenol cotton blue (LCB) and examined with a Leica DM 2500 compound microscope. The lichen substances were identified by thin layer chromatography following White & James (1985).

The species

Graphis neoraensis Jagadeesh & G.P. Sinha, **sp. nov.** Fig. 1

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Similis Graphis sikkimensis *sed ascosporis majoribus et acidum sticticum continens.*

Holotype – INDIA, West Bengal, Darjeeling district, Neora Valley National Park, Neora riverine forest, Primary rainforest, N 27° 06' 30.3", E 88° 43' 04.0", alt. 2245 m, 17 May 2008, *T.A.M. Jagadeesh Ram 4337* (BSA).

Etymology: the species epithet refers to the collection site (Neora Valley) of the holotype.

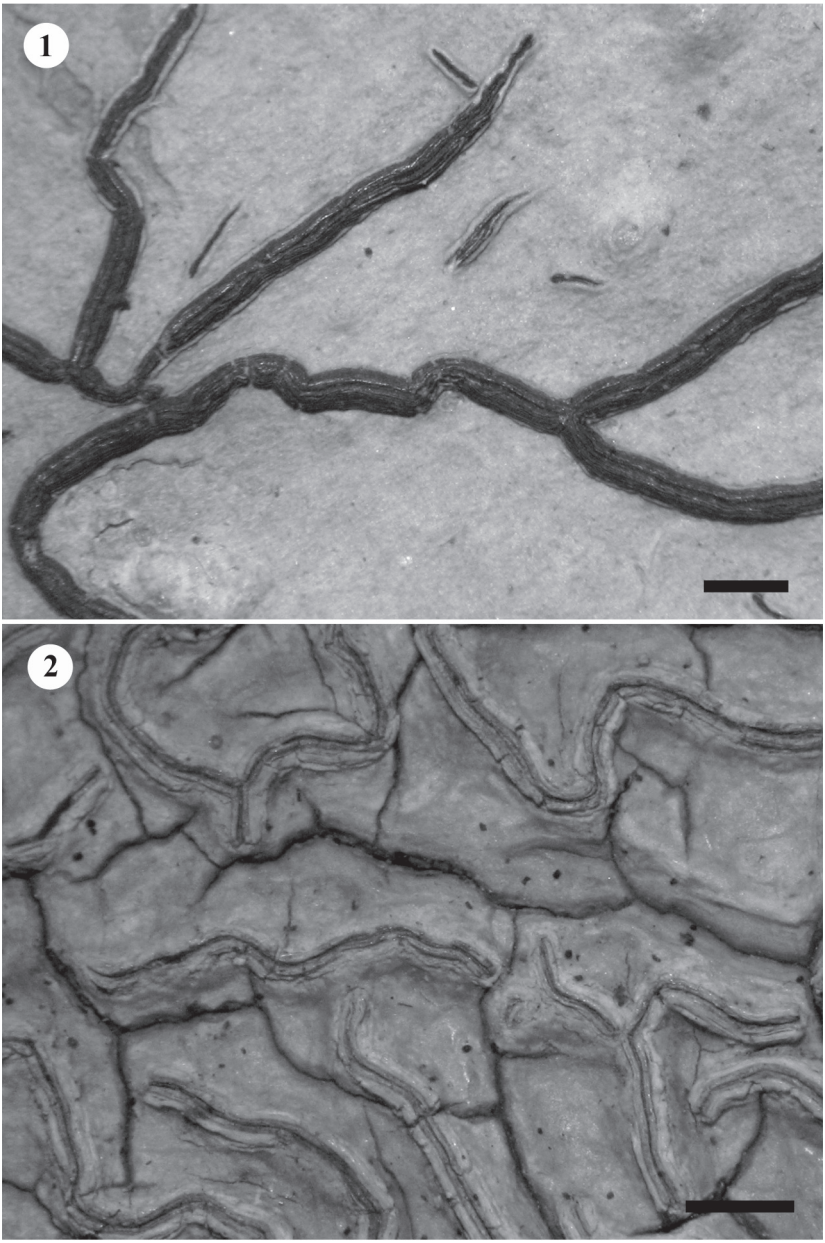
Thallus crustose, corticolous, endo- to epi-phloeodal, irregular, up to 11 cm across, yellowish grey to yellow brown, smooth, lacking calcium oxalate crystals, ecorticate to corticate, 52–80 µm thick; prothallus distinct, black, up to 3 mm wide; cortex 20–33 µm thick; photobiont layer 16–33 µm thick, photobiont *Trentepohlia*.

Ascomata lirellate, numerous, prominent, mostly radially to radially dichotomously branched, occasionally simple to furcate, straight to flexuous, 4–20 mm long, 0.25–0.45 mm wide. disc narrow slit-like. thalline margin distinct, lateral, partly covering the proper excipulum, occasionally absent when old, uneven, often verrucose, occasionally with calcium oxalate crystals in patches. proper excipulum complete, 5–13 striate, apically carbonized, yellowish to orange-brown laterally below the carbonized region and at the base, 100–200 µm thick laterally and 22–45 µm thick at the base. labia ± naked, convergent. epihymenium brown, 5–7 µm thick. hymenium hyaline, not inspersed, 100–135 µm high, I–. subhymenium hyaline, 16–20 µm thick. paraphyses simple, branched at tips, 1.5 µm wide. asci clavate to fusiform, 8-spored, 86–120 × 17–20 µm. ascospores biseriate, hyaline, oblong, not halonate, 12–17 locular, (50–)55–80(–96) × 7–9 µm, I+ blue-violet.

Chemistry – Thallus K+ red, C–, KC–, P+ yellowish, UV–; stictic acid (major) only detected by TLC.

Additional specimen examined – India, West Bengal, Darjeeling district, Neora Valley National Park, Zero Point – PHE Source foot track, N 27° 05' 10.3", E 88° 43' 17.8", alt. 2461 m, 16 May 2008, *Jagadeesh Ram 4286* (BSA).

Remarks – *Graphis neoraensis* is characterized by the yellowish grey to yellow brown thallus, large radially to radially dichotomously branched lirellae, the 5–13 striate apically carbonized excipulum, the 8-spored asci with 12–17 locular large ascospores, and the presence of stictic acid. It is close to *G. sikkimensis* Nagarkar & Patw. 1982, which is known from the neighbouring Tiger hill of Darjeeling and Sikkim; that species also has a yellowish thallus and long radially branched ascomata with 5–6 striate apically carbonized excipulum but differs in having 7–9 septate, smaller (24–44 × 6–8 µm) ascospores and in lacking



Figs. 1. *Graphis neoraensis* (holotype). 2. *Hemithecium himalayanum* (holotype). Scale = 1 mm.

lichen substances (Nagarkar & Patwardhan 1982, Adawadkar & Makhija 2007). *Graphis neoraensis* also resembles the morphologically and chemically similar species, *G. vittata* Müll. Arg. 1882, which also occurs in India as well as in Indonesia, China, and Taiwan. *Graphis vittata*, however, differs in having smaller (30–50 µm long) ascospores with fewer (8–12) locules (Müller 1882).

Hemithecium himalayanum Jagadeesh & G.P. Sinha, **sp. nov.** Fig. 2

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Similis Hemithecium laubertianum *sed hymenio inspersus et ascosporis minoribus.*

Holotype – INDIA, West Bengal, Darjeeling district, Neora Valley National Park, Mulkharka – Jorepokri foot track, Primary rainforest, N 27° 09' 37.8", E 88° 42' 56.1", alt. 2340 m, 18 May 2008, *T.A.M. Jagadeesh Ram* 4376 (BSA).

Etymology: the species epithet refers to the geographical region of the type collection site (Eastern Himalaya).

Thallus crustose, corticolous, epiphloeodal, orbicular to irregular, up to 20 cm across, yellow-green, smooth, shiny, cracked, with calcium oxalate crystals in patches, up to 160 µm thick, corticate; prothallus indistinct; cortex 40–78 µm thick; photobiont layer 20–50 µm thick, continuous, photobiont *Trentepohlia*.

Ascomata lirellate, erumpent, numerous, dense, simple to branched, flexuous, up to 20 mm long, 0.4–0.6 mm wide. disc narrow slit-like. thalline margin distinct, lateral, partly covering the proper excipulum, with prominent patches of calcium oxalate crystals. proper excipulum 3–5 striate, convergent, pale brown, continuing below the subhymenium, not carbonized, up to 150 µm thick laterally, up to 50 µm thick at the base. epihymenium thin, brown, 6–8 µm thick. hymenium hyaline, strongly inspersed, 100–125 µm high, I–. subhymenium hyaline, thin, 15–20 µm thick. paraphyses simple, 1–1.5 µm wide. asci clavate, 8-spored, 65–100 × 15–17 µm. ascospores biseriate, hyaline, oblong to oblong-ovoid, not halonate, 6–8 locular, 21–30 × 6.5–8 µm, I+ blue-violet.

Chemistry – Thallus K+ reddish, C–, KC–, P–, UV–; no lichen substances detected by TLC.

Additional specimen examined – India, West Bengal, Darjeeling district, Neora Valley National Park, PHE Source – Doley foot track, riverine primary rainforest, alt. c. 2150 m, 10 Mar. 2007, *Jagadeesh Ram 4008* (BSA).

Remarks – *Hemithecium himalayanum* is characterized by the epiphloeodal yellow-green thallus, the inspersed hymenium, the 8-spored asci with 6–8 locular small ascospores, and the absence of lichen substances in the thallus. It combines characters found in the allied genera *Hemithecium* and *Pallidogramme*. *Hemithecium,* which usually has a non-inspersed hymenium and hyaline I+ blue-violet ascospores, either lacks lichen substances or produces norstictic acid while *Pallidogramme* has an inspersed hymenium, brownish I+ red-brown

ascospores, and stictic acid and other stictic acid satellites as lichen substances (Lücking & Plata 2008). The hyaline I+ blue-violet ascospores and lack of lichen substances in the thallus support placing the species in *Hemithecium*. *Hemithecium himalayanum* somewhat resembles *H. laubertianum* (Fée) Staiger 2002, another species in the genus that also lacks lichen substances and has fewer ascospore locules; *H. laubertianum,* however, has a non-inspersed, I+ blue-violet hymenium and rather large (25–40 × 8–14 µm) ascospores (Staiger 2002).

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